Before the
FEDERAL COMMUNICATIONS COMMISSION
FCC 96-8

In the Matter of	)	
	)	
Amendment of Parts 2 and 15 of the	)	ET Docket No. 96-8
Commission's Rules Regarding Spread	)	RM-8435, RM-8608, RM-8609
Spectrum Transmitters	)	

Comments of ADTRAN

ADTRAN respectfully submits the following Comments in response to the Commission's Notice of Proposed Rulemaking (NPRM), ET Docket No. 96-8, released February 5, 1996.

Summary

ADTRAN supports a majority of the amendments to Parts 2 and 15 of the Rules. We favor higher gain antennas at 5800 MHz for point-to-point systems. We support the antenna pattern-uniformity proposal. We support SpectraLink's proposal to reduce the number of required hops in the 915-MHz band from 50 to 25. We have comments regarding changes to the direct-sequence spectral-power-density rule. We support codifying the two proposed methods of measuring processing gain. We favor maintaining the prohibition on one-hop frequency hoppers. We support the proposed changes to the out-of-band rules. We support adaptive hopset selection to mitigate or avoid interference. We support the ban on external RF amplifiers, and, with the exception of professionally installed systems, support the prohibition on "booster" antennas. We agree that a transition period for the amendments is probably not needed.

1. Interest of ADTRAN

ADTRAN develops, manufactures and markets digital transmission products. Its customers include the telephone operating companies, private network operators, and digital service providers. ADTRAN is a principal supplier of T1 infrastructure and ISDN hardware. Founded in 1986 and located in Huntsville, Alabama, ADTRAN has a workforce of over 900 and employs

more than 120 engineers. ADTRAN is completing development of the first of its *TRACER*™ series of high-speed, multiple-T1, spread spectrum modems for industrial/commercial, point-to-point communications.

2. Supports Higher Antenna Gain for 5800 MHz

ADTRAN favors the Commission's proposal to allow higher antenna gain in the 5800 MHz band, and opposes the petition of Western Multiplex Corporation (WMC) for the wholesale elimination of antenna gain limits for systems operating in the 2450 and 5800 MHz bands. ADTRAN supports the Commission's 3-for-1 rule to allow the output power of a 5800 MHz transmitter to be decreased 1 dB below 1 watt for every 3 dB that antenna gain exceeds 6 dBi. Our own calculations confirm the Commission's assertion that this would give a point-to-point transmitter with a high-gain antenna an equivalent area of interference to a transmitter with an omnidirectional antenna and maximum EIRP. In practice, a high-gain, point-to-point transmitter is likely to produce an even smaller area of interference than an omnidirectional transmitter, because the antenna of the point-to-point transmitter is typically located well above surrounding terrain and is pointed so as to clear intervening buildings, trees, and hills. Point-to-point systems typically present no interference to nearby systems that are located in the shadow of the horizontal beamwidth but below its vertical extent

Over the years, the three Part 15 spread spectrum bands have become niched by market forces and technological developments: The 915 MHz band is popular for cordless telephones operating under the spread spectrum rule and Part 15.249, the so-called "low-power" rule. The 915 MHz band is usable in the United States, Canada and a few other countries but not in Europe. The 2450 MHz band, available almost worldwide in one form or another for spread spectrum, is the standard band for wireless local area network (LAN) products and portable, high-speed data terminals complying with the interim IEEE 802.11 standard. The 5800 MHz band, with the highest development and manufacturing costs of the three, has been used primarily for point-to-point links. A check of the spread spectrum certifications issued over the last two years reveals 146 certifications at 915 MHz, 62 at 2450 MHz, but only 6 at 5800 MHz.

Of the 6 certifications at 5800 MHz, all but 2 are for commercial, point-to-point systems. We believe that permitting higher antenna gain for point-to-point systems operated at 5800 MHz under the Commission's 3-for-1 rule would encourage the migration of these systems to that band. We also believe that the current rules for 2450 MHz allow for more than adequate link margins provided the modem design is thorough and properly executed.

ADTRAN recognizes that a typical, compliant installation of a 5800 MHz system under the 3-for-1 rule might use 27-dBi antennas and achieve an effective radiated power of 100 watts from a 200 mW transmitter. While no one is going to cook a Thanksgiving turkey by hanging it in the beam on the end of a string, we recognize that the field strength near the antenna is relatively high despite the 200 mW transmitter. We believe that reasonable means should be taken to prevent an unsuspecting member of the public from wandering too close to the antenna. ADTRAN supports the proposal that a sign be attached to the antenna, perhaps on both front and back, warning of a potential RF radiation hazard. While microwave radiation is non-ionizing and has not been shown to produce harmful biological effects other than heating, wandering into the path of any sort of microwave link - spread spectrum or otherwise - is undesirable for the wanderer and system operator alike, and could raise the bit error rates of both. ADTRAN's *TRACER* products are intended for professional installation, and the highly directional antennas are generally mounted well above public thoroughfares, catwalks and the like. In a properly installed system the odds of any RF exposure to the public are practically nil. We do not believe that elaborate means of preventing exposure such as proximity sensors are warranted or necessary. Such means might prove ineffective in practice, and therefore be detrimental to public safety. ADTRAN would support a provision requiring that warning signs be placed near antennas and requiring language in the user/installation guide warning of the potential RF hazard. We do feel that it is our responsibility to inform our installers and operators of the limited hazard these systems pose, and we believe that a notice in the installation guide and the antenna signs would be a sufficient measure of protection

3. Supports Beam-Uniformity Proposal for High-Gain Antennas

ADTRAN also supports the Commission's proposal to require that antennas used in point-to-point systems have relatively uniform beamwidths in the horizontal and vertical planes. Requiring that horizontal and vertical gains differ by no more than a 2:1 ratio (3 dB) would minimize cross interference, and thus represents a win-win situation for both the point-to-point system and the nearby, incidental mobile user. ADTRAN supports keeping the +6 dBi antenna gain limit for multipoint and omnidirectional systems. We support restricting the sale of high-gain, point-to-point systems to commercial and industrial users, and support the Commission's proposal that manufacturers' operation and installation guides inform the operator of his responsibility to operate the system in a compliant manner.

4. Supports Denial of Symbol Technology Petition

ADTRAN supports the Commission's denial of Symbol Technology's petition to allow fewer hopping channels and wider channel bandwidths at 2450 and 5800 MHz. We believe that reducing the number of required hops in the 2450 and 5800 MHz bands from 75 to 20, as proposed by Symbol, could result in "bunching" of channels in certain areas of the band, leading to increased interference to systems that comply with the current rules.

5. Supports SpectraLink Petition

ADTRAN sees no harm in the SpectraLink petition for reduction of the minimum number of required hopping channels in the 915 MHz band from 50 to 25, concurrent with a reduction of channel bandwidth from 500 kHz to 250 kHz and a reduction of peak transmitter output power from 1 watt to 500 mW. ADTRAN agrees that this would serve to minimize cross interference with the new Part 90 Location and Monitoring Service (LMS), and thus supports this petition. ADTRAN supports the Commission's new §15.247(a)(1)(I) and §15.247(b)(2), the 915 MHz hopping provisions, as written in Appendix C.

Re the Additional Proposals

6. Direct Sequence Spectral Power Density

ADTRAN recognizes the need to readdress the spectral power density limit for direct sequence systems and supports the Commission's proposed changes to §15.247(d). We would like to point out a minor point of interpretation in the rule and in the related section of Appendix C which the Commission may wish to address. This concerns the use of the *marker-noise* or *noise density* function of the spectrum analyzer used for the test. The procedure noted in Appendix C allows the use of the noise density function if discrete spectral lines cannot be resolved in a direct sequence spectrum under test. We support this method of measurement. Deleting the noise-density provision from the procedure could encourage shorter-sequence, less-noise-like spreading codes in order to transmit higher power. However, use of the noise density function for this measurement seems inconsistent with the new rule as written, which states "peak." We believe this discrepancy should be addressed to prevent misinterpretation or possible confusion.

7. Definitions

ADTRAN believes that the Commission's new definitions for direct sequence and frequency hopping address the demands of current technology. We support the amended definitions as written.

8. Short-Duration FH

ADTRAN opposes the notion of permitting certification of degenerate frequency hopping systems that transmit all pending data in one hop, and thus do not use frequency hopping in the true sense of the word. One-way, uncoordinated networks of one-hoppers could lead to severe interference that would be bursty, difficult to identify, and nearly impossible to compensate for or avoid. We urge the Commission to retain the current criteria for FHSS that require a hopper to hop.

9. Measurement of Processing Gain

ADTRAN supports codifying the two alternative measurement procedures for determining processing gain that are identified in Appendix C. We believe that one of these two tests will give a substantive evaluation of the quality of every direct sequence spread spectrum system, that the two tests are equivalent or near-equivalent for evaluating processing gain, and should be sufficient to preclude the certification of non-compliant systems.

10. Re Unwanted Emissions

ADTRAN supports the Commission's proposal to amend the rules to permit out-of-band measurements to be either conducted or radiated measurements, as well as a reference to the restricted-band provisions that sometimes cause confusion or misinterpretation.

11. Coordination of Hoppers

ADTRAN strongly supports changing the rules to permit hoppers to adapt their hopsets to their RF environments. Under current rules, if a 2450 MHz frequency hopper using 75 hops and a 1-MHz channel bandwidth were unable to use, say the lower 20 MHz of its band because that portion was occupied by a direct sequence system, that hopper would have to transmit on those channels anyway in order to comply with the rules, even while transmitting no useful information to its intended receiver and jamming the DS system whenever it passed through the DS unit's frequency band. This situation certainly was not intended in the Rules and should probably be rectified. As mentioned in the NPRM, this would allow some users to "coordinate" hop sequences. In a network, this might be a good thing, because it could increase throughput and decrease retransmissions and channel occupancy thereby minimizing interference to other users. It is also possible that developers could build banks of hoppers into a rack, having each "coordinating" its way into virtual synchronization. The Commission may wish to consider limiting the number of adaptive hoppers that could be collocated.

12. External RF Amplifiers

ADTRAN strongly supports the Commission's prohibition on external RF amplifiers and "booster" antennas, and believes these devices have no place in the legitimate telecommunications trade. ADTRAN requests that the Commission consider codifying the rules regarding systems that are professionally installed and the types of antennas they may be used with. For example, there are several manufacturers of parabolic dish antennas for 2450 and 5800 MHz point-to-point systems. The 26-dB gain, 8-foot-diameter antenna of Manufacturer A, in our experience, is indistinguishable on the test range from the 26-dB gain, 8-foot antenna of Manufacturer C. Many of our customers, for reasons of economy, wish to purchase their own antennas when they purchase our radio. While the current rules give some latitude in our exercising engineering judgement in permitting the use of equivalent antennas, we are concerned that changes proposed in Appendix B, §15.204(d) could significantly hinder our marketing these products. Incorporation of a professional-installation exclusion as is contained in §15.203 would maintain the status quo and mitigate our concerns.

13. Transition

With possible exception of the aforementioned §15.204, ADTRAN agrees with the Commission that these rule changes do not impact existing equipment designs, and that the changes are liberating rather than restrictive. Our concerns re §15.204 notwithstanding, we concur that these rule changes should become effective upon publication in the Federal Register.

14. IRFA

ADTRAN agrees with the Commission's assessment that these changes will have no negative impact on small entities.

15. Minor Errors

In Appendix C, §15.247(d), bullet 3 states that a 30 dB correction should be used to go from 1 Hz noise bandwidth to 3 kHz. We believe the correct figure is 34.8 or - rounded off - 35 dB. Most spectrum analyzers have a resolution bandwidth that differs slightly from the noise power

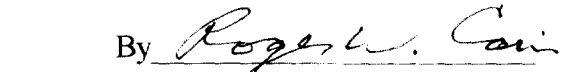
bandwidth, and detection is typically performed by logarithmic IF amplifiers followed by peak detectors. Both of these factors will cause differences in the instrument's response to noise versus discrete carriers, and gives a 1.7 dB net error for most instruments. The "marker noise" function on the analyzers subtracts this error, thus the conversion from the 1 Hz bandwidth in which the analyzers calculate their noise power should be corrected by adding 34.8 dB to get noise power in a 3 kHz bandwidth.

In Appendix B, the Proposed Changes to the Regulations, §15.247(b)(4)(iii), line 1 reads "shall not be *market* to," should be "marketed." Later in Appendix C, §15.247(d)(1) line 1 says "measured at the demodulate output of the receiver," which we believe should be "demodulated."

Conclusion

ADTRAN applauds the Commission's efforts to clarify the Rules regarding spread spectrum systems and to codify the procedures that have evolved over the decade that the rule has been in place. In that decade, the spread spectrum industry has migrated out of the garage and basement shops of entrepreneurs and grown into a billion-dollar-a-year industry. And we feel it's just getting started. With exception of the concerns noted above, ADTRAN supports the Commission's proposals, and wishes to recognize the Commission and its technical staff for the diligent and excellent work in the drafting, maintenance, and updating of the spread spectrum rules.

Respectfully submitted,
ADTRAN, Inc.

By 

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